

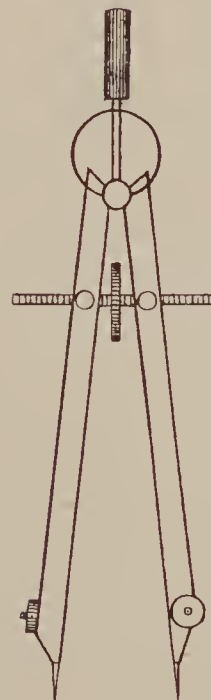


MAP EDITING GUIDE

A Brief Guide to the Review and Editing
of Maps and Graphics

Stephen Meszaros

U.S. Department of the Interior
Bureau of Land Management
Arizona State Office



Phoenix, Arizona

2002

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ERRATA

Note that there are a number of blank pages in this document. All the required information *is* present (nothing has been left out). There was a lack of communication between BLM and the printer, resulting in these blanks. This is of course rather ironic, considering that this is an *editing* guide! It does point up the fact that constant oversight is necessary on any project, and even then mistakes do happen. Obviously editing and review *are* very important.*

I would invite the reader to utilize the blank pages to take notes or make comments on the material presented in that immediate section. If you have any questions about this document, you may contact me at the address indicated on page 34.

The Author

*There is one beneficial result of the blank pages. The reader will note that this document has been printed on paper that is rather cheap and transparent – resulting in quite a bit of “bleed-through” of the images. By printing on only one side of the page, this problem has been alleviated to some degree.

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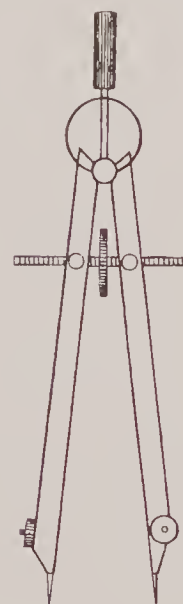
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ABSTRACT

Various techniques for reviewing and editing maps are demonstrated. Special subject edits and the review of graphics are also briefly discussed.

AUTHOR'S NOTE

This document may be considered as both an extension and a supplement to an earlier work by the author, *Cartographic Notebook: A Brief Guide to some aspects of Cartographic Design* (U.S. Department of the Interior, Bureau of Land Management, Arizona State Office, Phoenix, Arizona, 2001). The extension is "Part I: Editing Techniques" wherein various methods of reviewing and editing maps are discussed. The supplement is "Part II: Special Edits" which adds to the data presented in the *Cartographic Notebook*. Please consult that publication for more detailed information on map design and construction.

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THE GOLDEN RULE OF CARTOGRAPHY:

"A Map must be Readable, Understandable, and Accurate"



INTRODUCTION

The Need for Editing

All maps that are going to be printed, used in presentations, or exhibited to the public – in any manner – should be edited. This also applies to graphics and other visuals destined for mass distribution. As with any other type of human endeavor, mistakes, inconsistencies, and oversights can creep into the map making process. A rigorous review and edit of the maps by competent personnel should be able to eliminate most, if not all, of these errors. This is especially important today, with the wide-spread use of computer mapping programs by people who are not trained or experienced in professional cartography.

What to Edit

In the editing of a map, to make sure it is successful, three attributes must be taken into account. I refer to this as *The Golden Rule of Cartography*, which may be stated as follows:

THE GOLDEN RULE OF CARTOGRAPHY

A Map must be Readable, Understandable, and Accurate.

First, the map must be readable. The text should be large enough to see, the line weights bold enough to be visible, and the design not so complex or cluttered that it is, in fact, unreadable. Second, the map must be understandable. It should be designed *for* the educational and experience level of the target audience, so that they will be able to understand it. Finally, the map must be accurate. All data presented upon it has to be correct and as current as possible, otherwise it will be a failure. These are the three items – the *Golden Rule* – that need to be examined in a map edit.

How to Edit

Keeping in mind *The Golden Rule of Cartography*, the following pages describe some techniques for map editing so that the maps will be of an acceptable quality.

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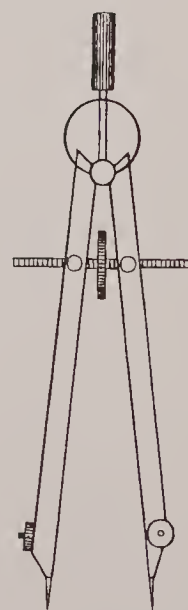
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Part 1: EDITING TECHNIQUES



THE OVERVIEW

The first step in map editing is to take an overall look at the map – in its entirety – to become familiar with it. This is the “Overview.” What is the general appearance of the map? Is it clear and clean? Is it “straight” on the page (not crooked)? Are the tones and/or colors clear, and can they be differentiated? Does the map contain its required elements? Mandatory map elements would include: a title, legend, scale, location diagram, and coordinate system of some type. Other desirable map elements might include a north arrow (*mandatory* if north is not toward the top of the map), an organization logo and/or organization information (including the map date), and a disclaimer – if required. Looking a bit closer, is the line work clean and crisp; does the text appear to be evenly spaced and of a readable size?

Regarding some of the major map elements, the title should be the largest text on the page and should adequately express the purpose or content of the map. The legend essentially explains the items, or symbols, used on the map. All symbols (including tones and/or colors) on the map *must* appear – and be explained – in the legend. They should also be the same size in the map and legend, to avoid confusion by the reader. The scale may ideally be shown in both English and metric units, to accommodate all map users. The location diagram should show the site of the map within a larger geographical area that is familiar to the target audience.

After viewing the map in the preliminary Overview stage, we are now ready to examine it in more detail. Figure 1 shows a hypothetical map that will be “dissected” using various reviewing techniques in the following pages.



THE UNIT EDIT

One of the most powerful methods of systematically reviewing a map is to use the “Unit Edit” technique. This is actually nothing more than examining each of the individual map components or units in turn, to make sure that they are complete and correct. Examples of map components would include the following: the transportation net, cultural features, political divisions, hydrologic features, physical relief, land ownership or management status, and a host of other possibilities. In fact, this list includes whatever is displayed on the map. As an example, let’s start a unit edit of the map shown in Figure 1.

It would be logical to begin with the physical landscape of the area (mountains, valleys, rivers & lakes, etc.) and then proceed to the cultural features upon this landscape (cities, towns, roads, etc.). However, for ease of graphic reproduction in this document, I am going to use only line and point sources as examples.

Let’s examine the road net first. Figure 2a shows the system of roads extracted from the complete map in Figure 1. Of course, when editing a map you won’t be able to see *just* the roads as depicted here. This figure is meant to indicate that you will be *concentrating* upon the roads only, and ignoring all the other map components. First, is the road net complete? Are there any that “disappear” part way through the map? Are there any “gaps?” Is the highway hierarchy system (federal roads, state roads, county roads, multi-lane roads, paved roads, dirt roads, etc.) adequately indicated by line boldness, style, and/or color? And are these all displayed and explained in the legend? Are all the highways appropriately numbered and/or named? Is this information accurate? These are the kinds of questions you will need to ask as you edit the road net. Finally, be aware of how this highway system interfaces with the rest of the map elements. Make sure that none of the roads appear to “drive” over high mountain peaks or into lakes!

Moving on to cultural features – which in this example we will take to mean as cities, towns, and villages – examine Figure 2b. Here we have again extracted these features “graphically,” although you will be doing it “mentally” for your edit. Are the appropriate cities and towns shown, considering the overall purpose of the map? Are their names spelled correctly? Does the text size and boldness correlate properly with their population and/or importance? Is the text placed correctly with respect to the town locations and is it easily readable? Finally, do these cities and towns relate “logically” to the other map elements, such as roads and rivers?

Next let’s consider political divisions – see Figure 2c. This is the separation of the landscape

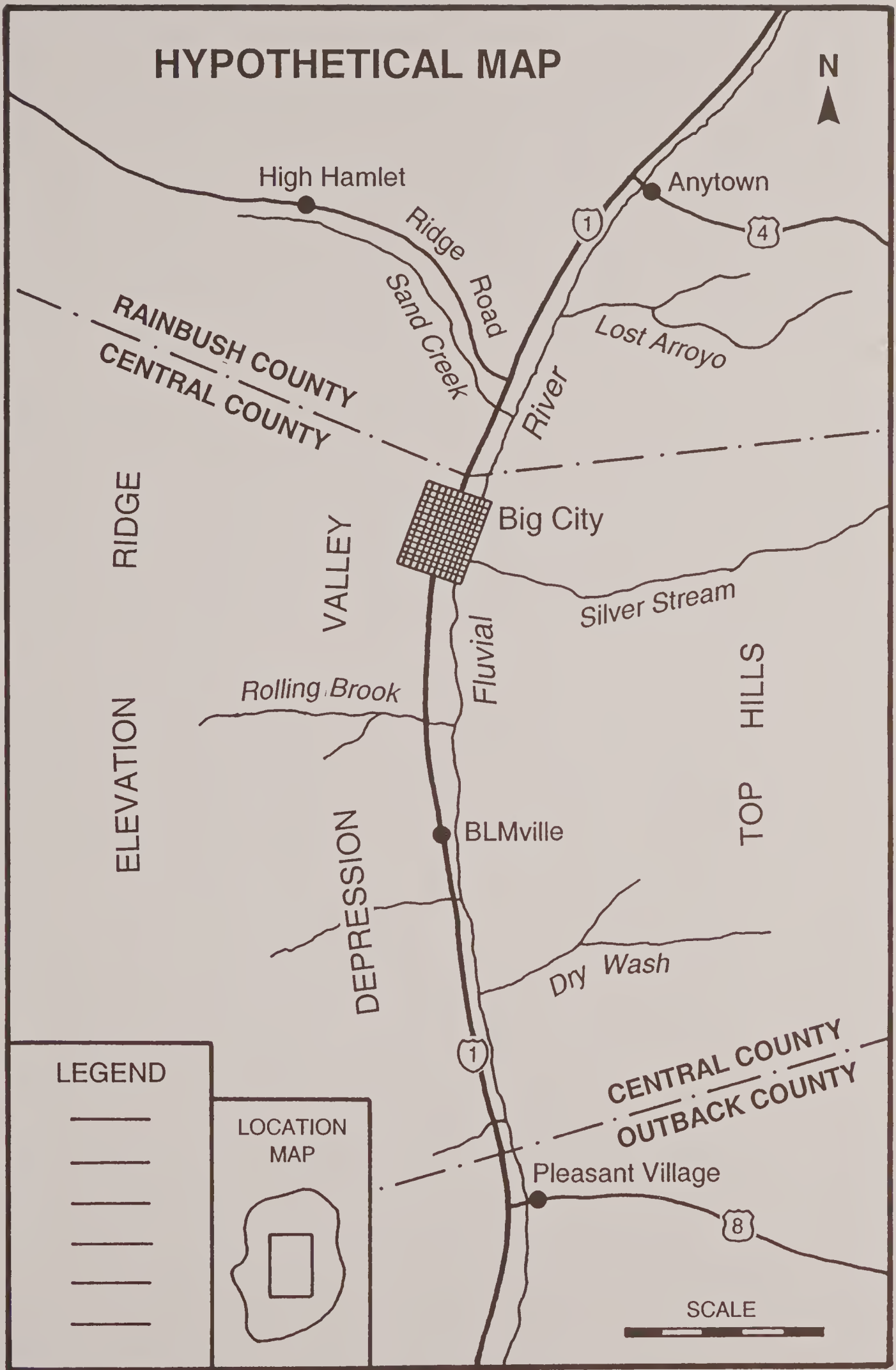


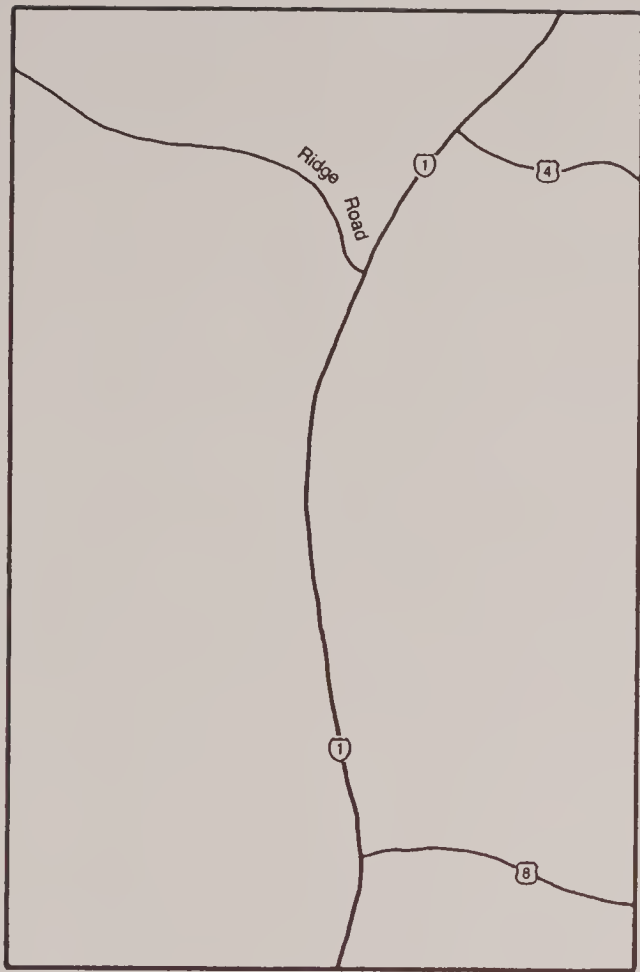
Figure 1



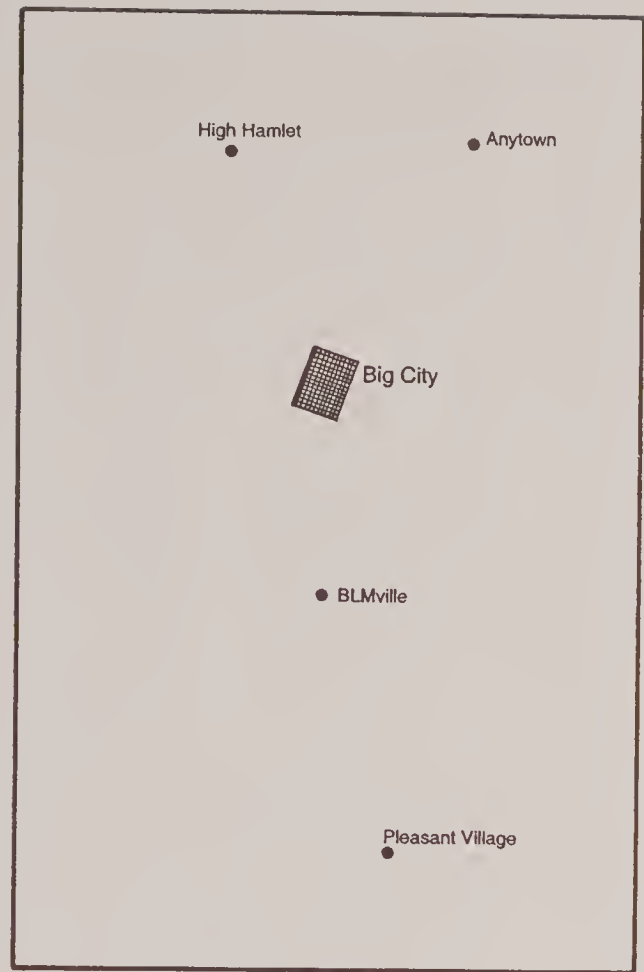
into legal parcels, utilizing boundary lines. Common examples include national boundaries, state boundaries, county boundaries, city boundaries, etc. There are however an almost infinite number of divisions that may be utilized on maps: Indian reservation boundaries, hunting boundaries, census tract boundaries, the list goes on and on. (And this does not even include scientific boundaries such as geologic units, soil types, vegetation communities, etc.) The accurate placement of all these boundaries and the differentiation of the types of lines showing them is paramount in map construction. Making sure that they are current is also of vital importance. Again, coordination of political divisions with the other map elements must be achieved.

Finally, let's look at hydrologic features – rivers, lakes, ponds, etc. – as the last of our map components to be considered – see Figure 2d. Which of these should be shown on the map, and at what detail? For example, we would probably include rivers and larger streams, but how about smaller creeks and even rivulets? Of course, the detail of the drainage system depends upon the purpose of the map. This is one more element that must be examined closely. Also, you don't want to find that some of the streams are flowing "over" mountain ridges or "out of" their stream banks! Consequently, the relationship of the hydrologic features to the relief and other map components must be examined along with their specific edit.

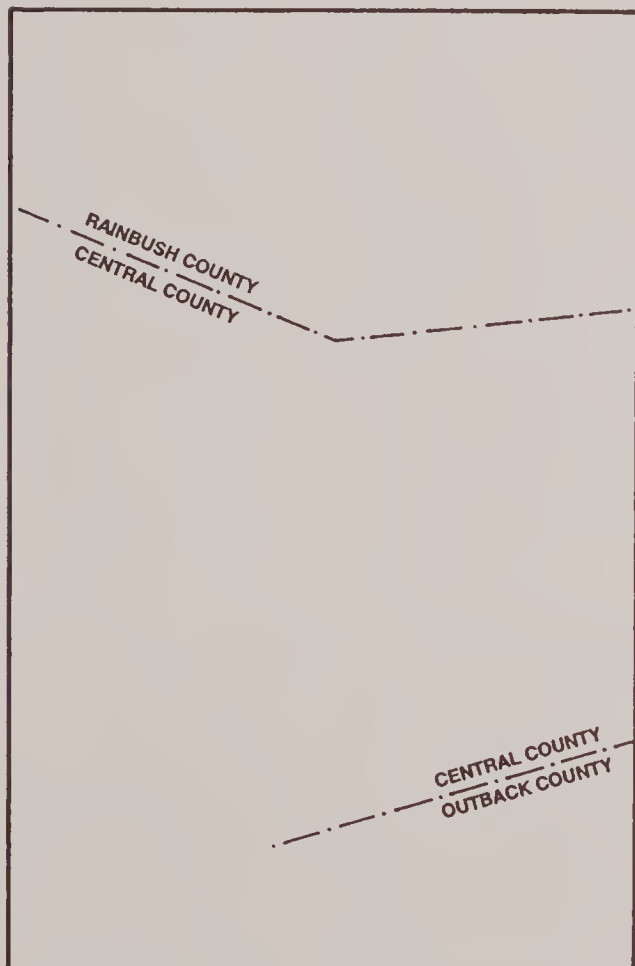
The previous four map samples were meant to be examples of the use of the "unit edit method" of map editing. Of course, many other elements will need to be selected and reviewed for a successful edit. In each case the specific component should be reviewed individually first, then its relationship to the other map elements present must be analyzed. Following the unit edit a more in-depth review may be undertaken, if we are to accomplish a complete systematic edit. This is the "grid edit technique" and is discussed in the following section.



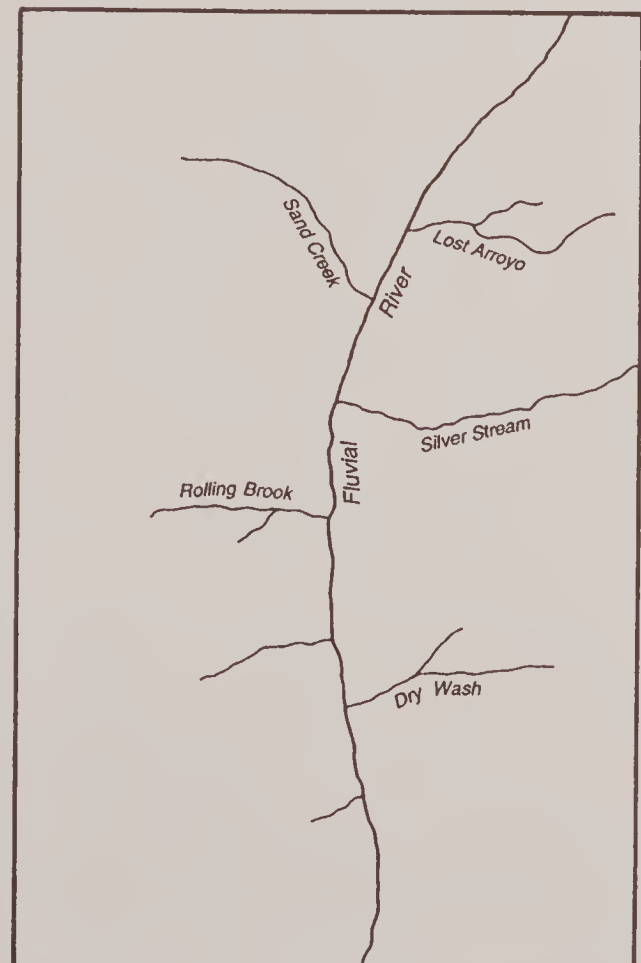
2a



2b



2c



2d

Figure 2



THE GRID EDIT

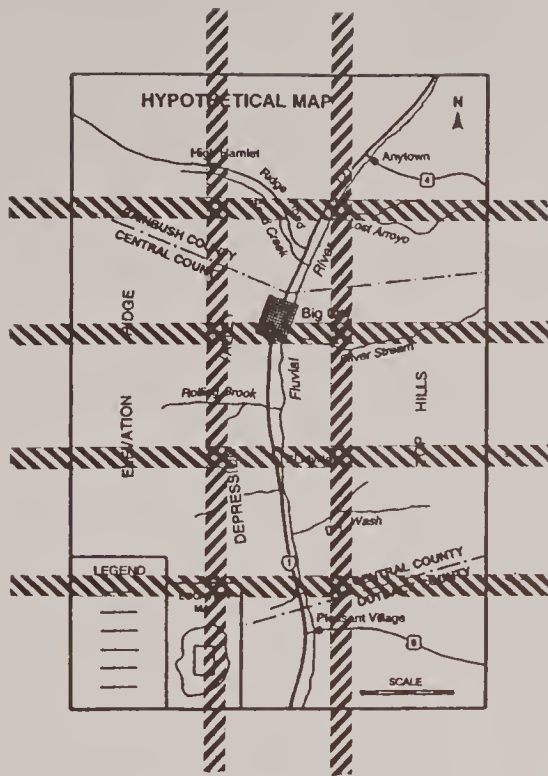
The “Grid Edit” technique involves dividing the subject map into a number of specific parts or “quads” for an in-depth review. Unlike the unit edit method – where a specific component was examined over the entire map – the grid edit requires the examination of *everything* within each selected quad. Designating the quad dimension depends upon choosing a “manageable” size that can be conveniently analyzed. In particular, it must not be so large that it is overly complex, resulting in too many items requiring examination at the same time.

Sometimes a map is already divided into a series of quads that can be conveniently used by the reviewer. Latitude and longitude lines, township and range divisions, and other types of partitions on the map may be utilized in the editing process. However, if these are not available, or are of the wrong size, you (as the editor) will have to create your own quads for analysis. Perhaps – if you’re “good” – you can do this mentally. Otherwise an overlay grid on tracing paper can be useful in designating the areas to be studied. In any event, as mentioned earlier, don’t “bite off more than you can chew” or accurately review at one time.

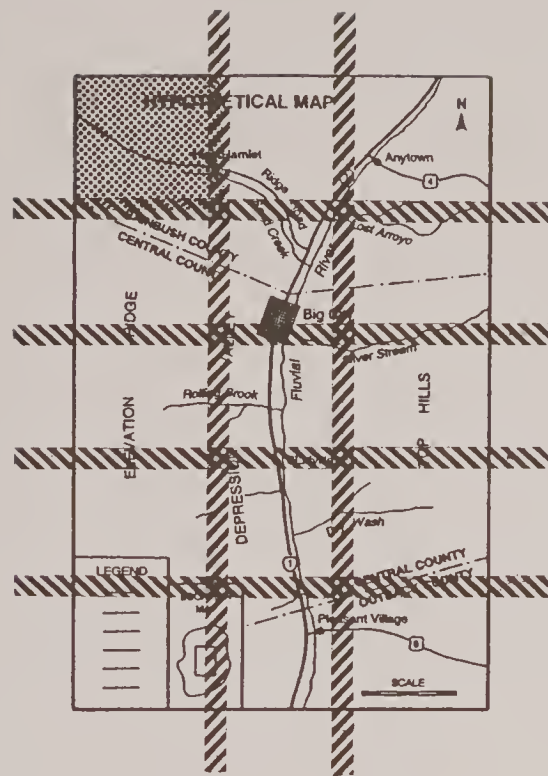
Figure 3 demonstrates how the grid edit technique works. In Figure 3a the map has been divided into a manageable number of quads, in preparation for the review. Figure 3b shows the first quad to be edited. *Each* and *every* feature within the quad must be analyzed (and consideration must also be given to anything that may be *missing* from the area). Once this is completed, move to the adjacent quad – Figure 3c – and begin the edit there. This is followed by the next quad in turn – Figure 3d – and so on. How you proceed across the map is immaterial (horizontally, vertically, or some other orientation). What *is* important is that you do it in a systematic way and make sure you cover *all* the quads in your edit.

There is one other thing to consider during a grid edit. That is the fact that – although you are concentrating on each quad individually – they don’t actually exist “alone.” Once the review of each is complete, you must check its connection with its neighboring quads along all applicable edges. You do this in order to make sure that all appropriate features (roads, rivers, etc.) continue properly from one quad to the next. In this way you mentally “tie together” the quads, into the final map. This is indicated schematically in Figure 3e.

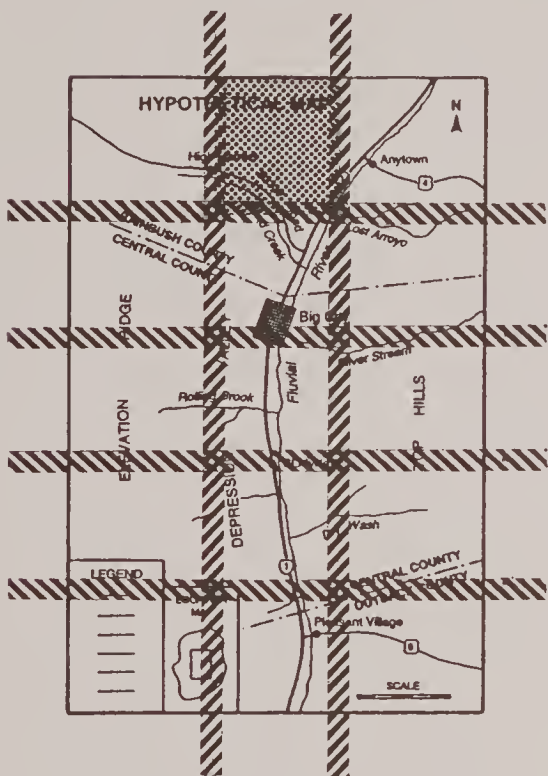
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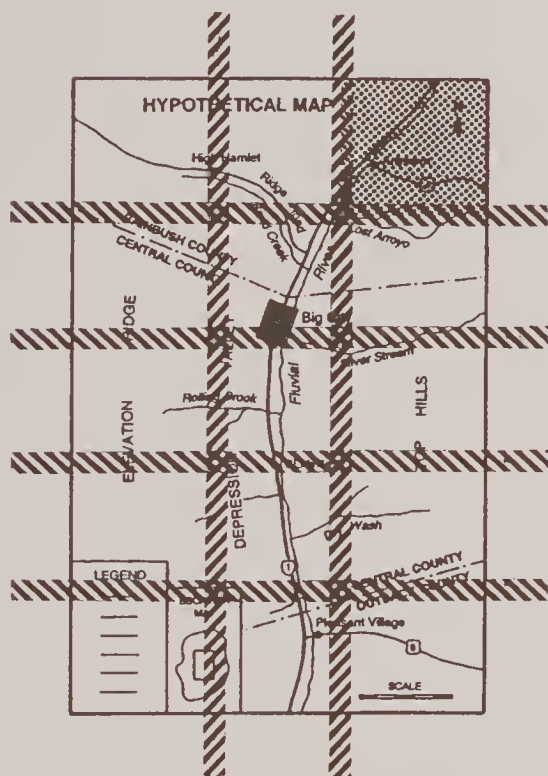
3b



3c



3d



3e

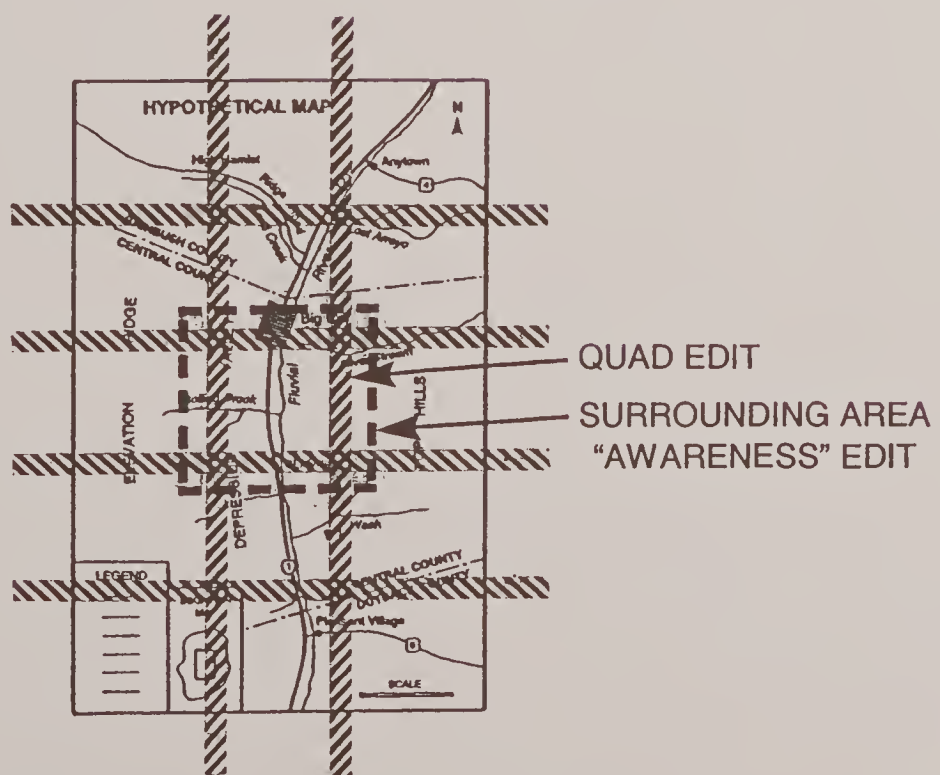


Figure 3

THE FINAL OVER-ALL EDIT

After the unit and grid edits have been accomplished, it is advisable to have one more over-all look at the map. This should be a general review of the appearance of the map and its various components in their entirety. Spot checks of critical or complex areas can also be done at this time. If possible, it is useful to have another person experienced in cartography and/or graphics take a look at the map. A “second pair of eyes” is very handy in spotting any errors that may have been missed. Actually it’s also not a bad idea to have a coworker from another professional field view the map. Sometimes map editors, because they are concentrating on technical details, can miss an otherwise “big picture” mistake. In effect, they “miss the forest while looking at the trees!”

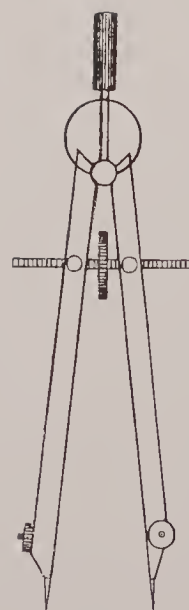
If it’s not possible to have a second person complete a quick review of the map, you should at least do a brief edit on a different day. In fact, if this is done several days later, it is even better. Approaching the map with a fresh mind and outlook at this time can, on occasion, expose errors and inconsistencies that may have been missed during the first edit.

CONCLUSION

When editing a map (or graphic) the reviewer should examine not only its individual components, but also view the map in its entirety. Concerning the components, all the separate details must be correct. Regarding the entirety, all the components must function together smoothly and accurately. Making sure that this happens is the overall purpose of map editing.

Lastly, although a map is not usually considered “a work of art” its appearance should be pleasing to the eye. If the final result can combine technical accuracy with attractiveness, a superior map will have been produced.





Part II: SPECIAL EDITS



EDITING FOR THE INTERNET

The same editing methods and cartographic rules (the “Golden Rule of Cartography”) apply to Internet maps and graphics. However, it is very important to examine these visuals *after* they have been scanned and placed on the Web, to make sure that they have made the “transition.” As a case in point, Figure 4 shows an original map that was used for a handout (reduced here to 70%). Figure 5 displays the same map as seen on the BLM Arizona public web page. It is obvious that the Internet version is of poor quality and, in fact, most of the text is not even readable. Figure 6 is another original handout (again reduced to 70%). Figure 7 is the Internet version. In this computer visual practically nothing is readable and even the lines are of very poor quality.

It is rather amazing that these maps (and others like them) have been allowed to remain on the web page for a considerable amount of time, without correction! This points up the fact that maps and graphics must be edited, both *before* and *after* they are placed on the Internet.

THEORY OF THE EARTH

CHAPTER I.	OF THE ORIGIN AND GROWTH OF THE EARTH.
1. The Earth is a sphere, and its surface is covered with water.	2. The water is divided into oceans, seas, and rivers.
3. The land is divided into continents, islands, and mountains.	4. The mountains are formed by the action of fire and water.
5. The fire is the cause of the heat of the sun and the heat of the earth.	6. The water is the cause of the cold of the sun and the cold of the earth.
7. The air is the cause of the wind and the rain.	8. The earth is the cause of the soil and the plants.
9. The plants are the cause of the food and the animals.	10. The animals are the cause of the man and the woman.

THEORY OF THE EARTH

THEORY OF THE EARTH

THEORY OF THE EARTH



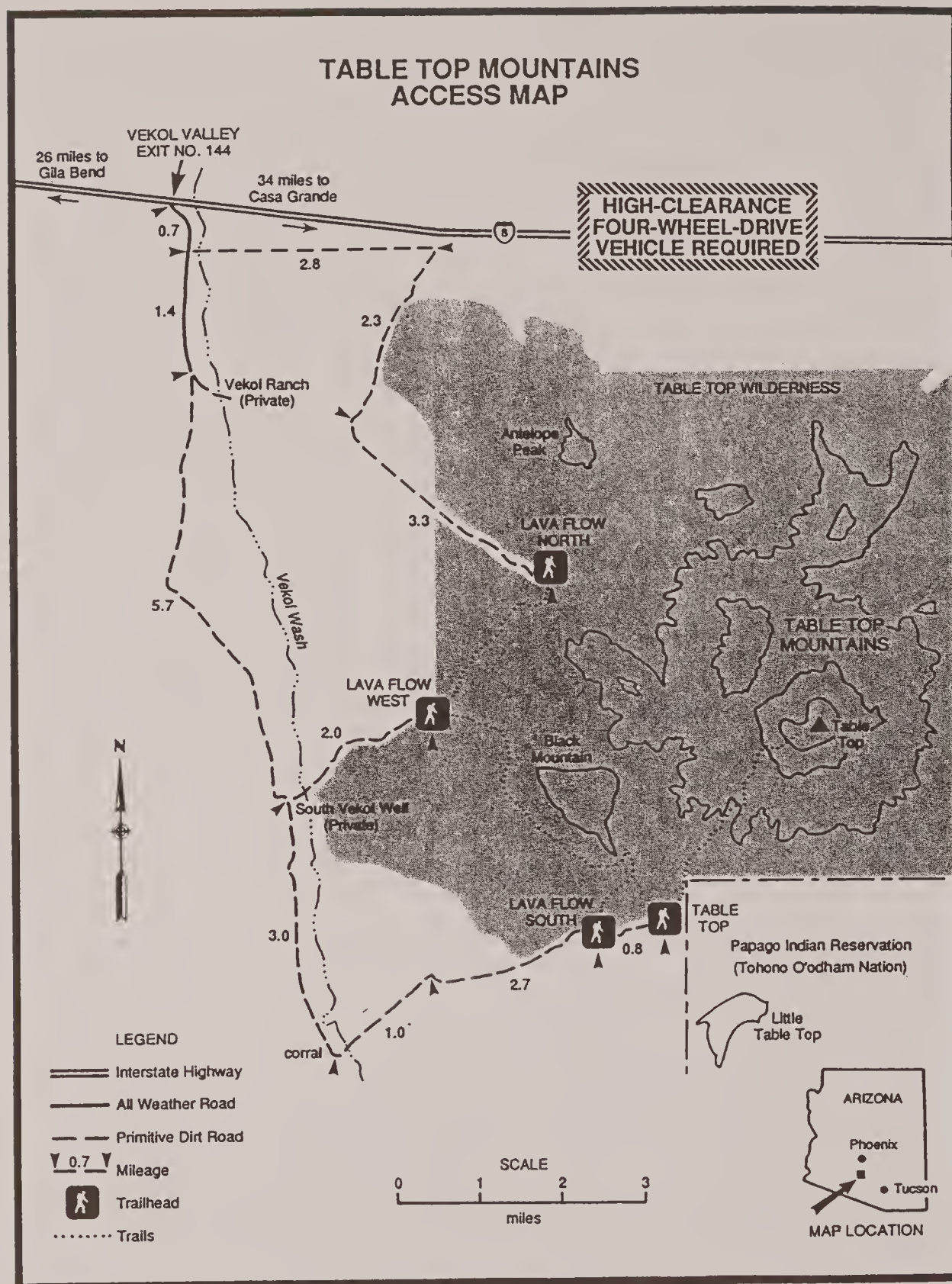


Figure 4

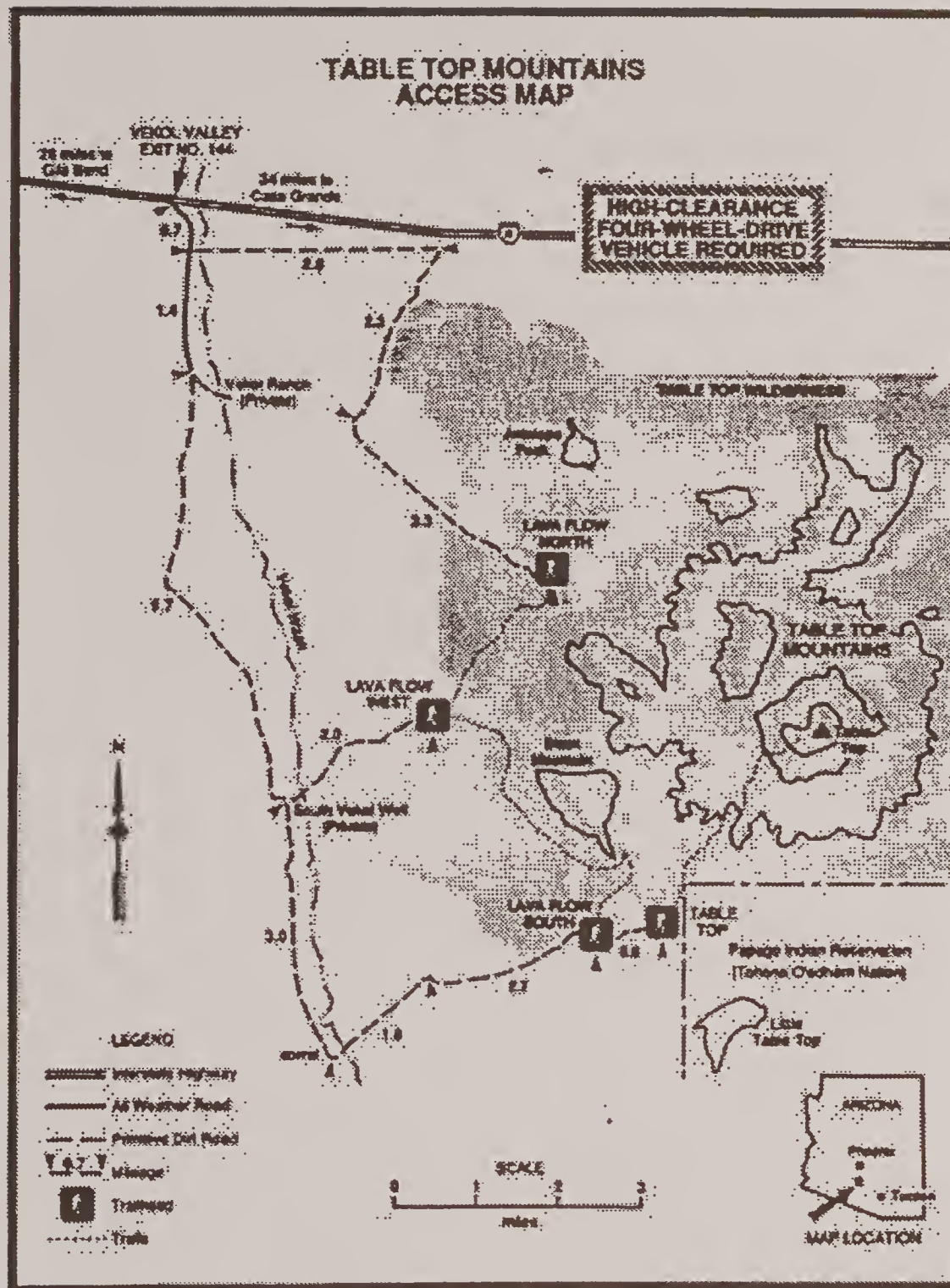


Figure 5





NORTH MARICOPA MOUNTAINS ACCESS MAP

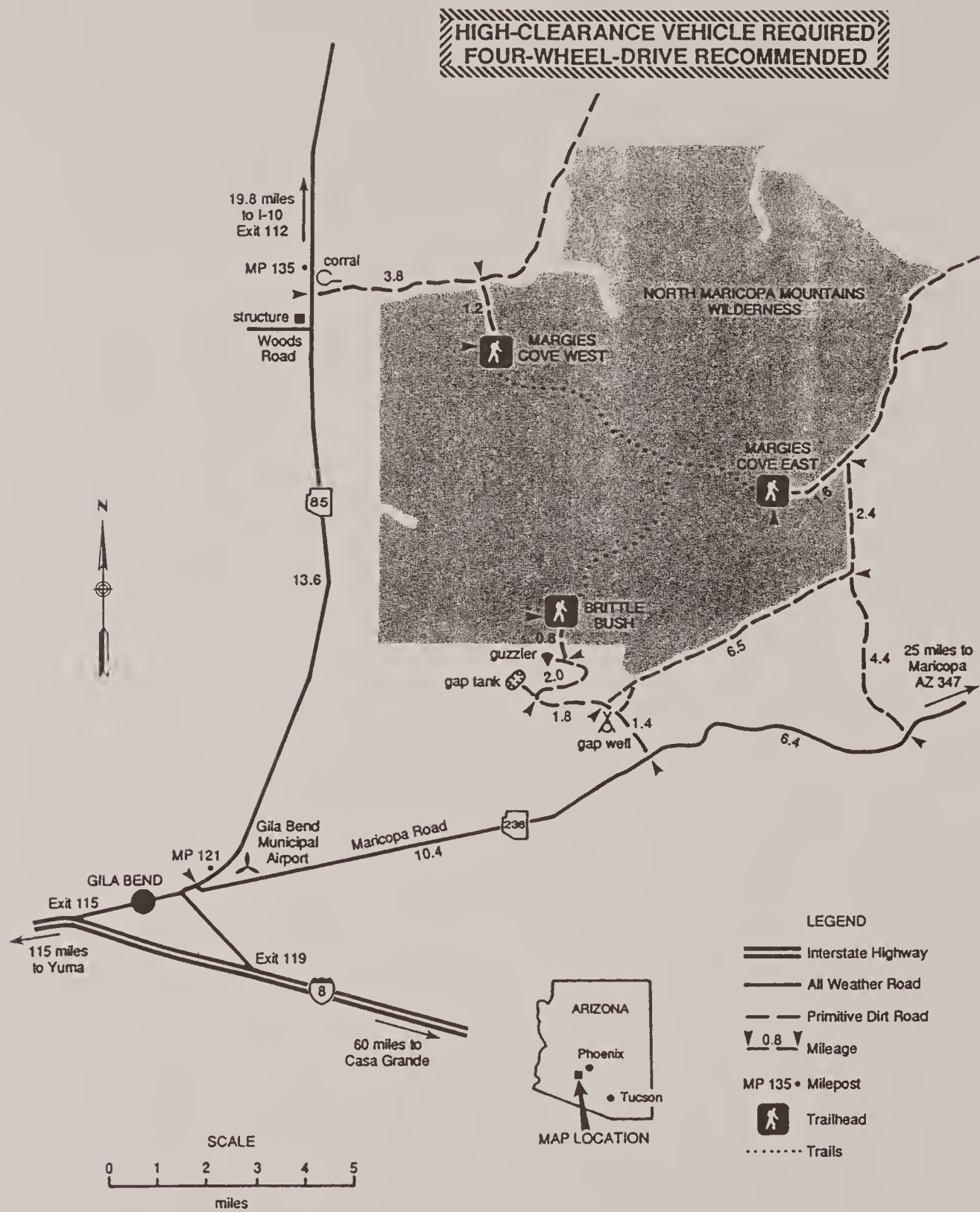


Figure 6

NORTH MARICOPA MOUNTAINS ACCESS MAP

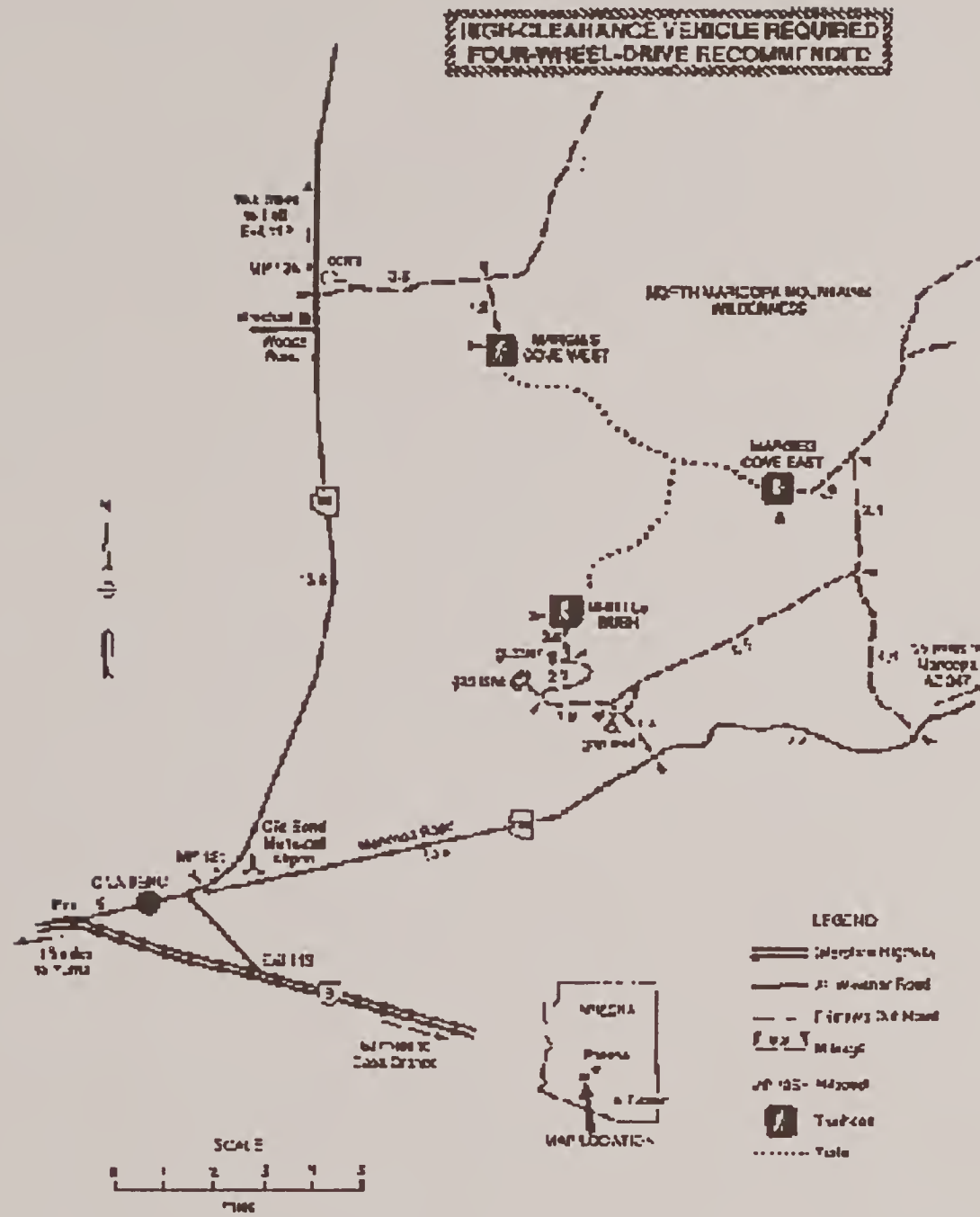


Figure 7

THEORY

When a body is placed in a fluid, it experiences a buoyant force. This force is equal to the weight of the fluid displaced by the body. This is known as Archimedes' principle.

The buoyant force acts vertically upwards from the center of the displaced fluid.

If the weight of the body is greater than the buoyant force, the body will sink. If the weight is less than the buoyant force, the body will float.

If the weight is equal to the buoyant force, the body will be in equilibrium and will neither sink nor float.

The buoyant force is a result of the pressure difference between the top and bottom of the body. The pressure is greater at the bottom than at the top, resulting in a net upward force.

The buoyant force is also dependent on the density of the fluid. A body will float in a fluid if its density is less than the density of the fluid.

The buoyant force is also dependent on the volume of the body. A larger body will displace more fluid and therefore experience a larger buoyant force.

The buoyant force is also dependent on the depth of the body in the fluid. The deeper the body is, the more fluid it displaces and the larger the buoyant force.

The buoyant force is also dependent on the shape of the body. A body with a larger surface area will displace more fluid and therefore experience a larger buoyant force.

The buoyant force is also dependent on the temperature of the fluid. The density of the fluid decreases as the temperature increases, resulting in a smaller buoyant force.

The buoyant force is also dependent on the viscosity of the fluid. A more viscous fluid will exert a larger drag force on the body, resulting in a smaller buoyant force.

The buoyant force is also dependent on the surface tension of the fluid. Surface tension can cause a body to float on the surface of the fluid, even if its density is greater than the density of the fluid.

EDITING FOR EXHIBITS AND DISPLAYS

The same reviewing methods and “The Golden Rule of Cartography” apply to exhibits and displays. However, in this case the map should be considered as a type of “display graphic.” The viewer will be observing it briefly from a distance – perhaps several feet away – so some specific criteria must be taken into account.

Size and Boldness: Because the map is being viewed from a distance, all lines need to be bold enough to be seen. Text should appear at a size that is easily readable – ideally no smaller than 24 point (see the Appendix). Colors and/or tones must also be easily distinguishable.

Content: All the necessary map elements must be present to make the map readily understandable. These would certainly include the title (*always* the largest text), the legend, scale (absolutely necessary), and a location diagram. Various coordinates, organization information, the date, and a disclaimer (if necessary) may be appropriate.

Simplicity: Since the map will be viewed for a brief period of time (while the visitor is at the display looking at it), it must be relatively simple and straightforward in getting the message across. The average person is not going to stand for a long period of time, analyzing a complex visual. Extraneous material must be omitted. If more detailed information is necessary (as an adjunct to the main map subject) it should be made available as a handout.

To summarize, maps and graphics used in displays and exhibits should be easily readable from a distance, inclusive in their content, and “straight to the point” in their subject presentation.

EDITING FOR PUBLICATIONS

The editing techniques explained in the first part of this document were specifically designed for publication edits. Publication maps and graphics are more fully covered in *Cartographic Notebook: A Brief Guide to some aspects of Cartographic Design* (see the “Author’s Note” on page v). In general, “The Golden Rule of Cartography” always applies: *A Map must be Readable, Understandable, and Accurate* (see the Introduction).

EDITING FOR PRESENTATIONS

Presentations follow many of the same graphic rules as those for exhibits and displays, mentioned previously. The maps and graphics must be of an adequate size and boldness to be visible, even from the back row of the audience. They need to be *inclusive*, containing all the required information in each separate visual. They should also be as simple as possible so that the viewer is able to comprehend the information being presented, in the short time that the visual is projected onto the viewing screen. These are the factors that the reviewer must consider, when editing material for presentations.

Additional information may be found in the *Cartographic Notebook* (especially the “Appendices” section) referred to in the “Author’s Note.”

THEORY OF THE EARTH

BY J. H. VAN DIJK

THEORY OF THE EARTH. BY J. H. VAN DIJK. Pp. 1-100. 1910. 10s. 6d.

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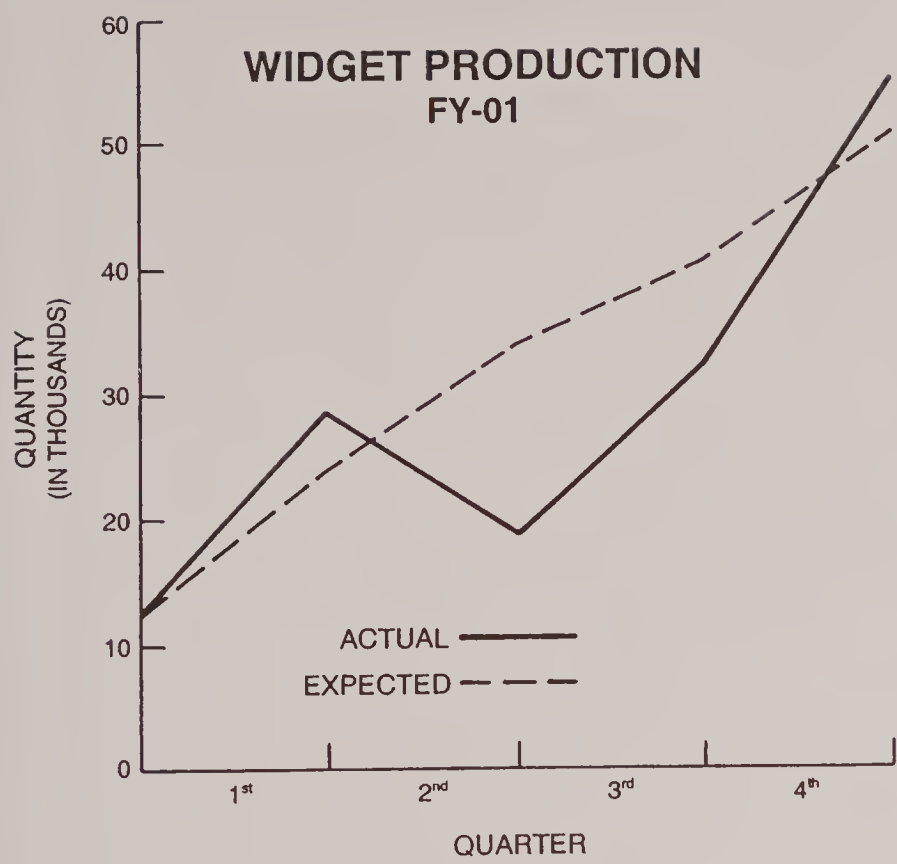


GRAPHIC EDITS

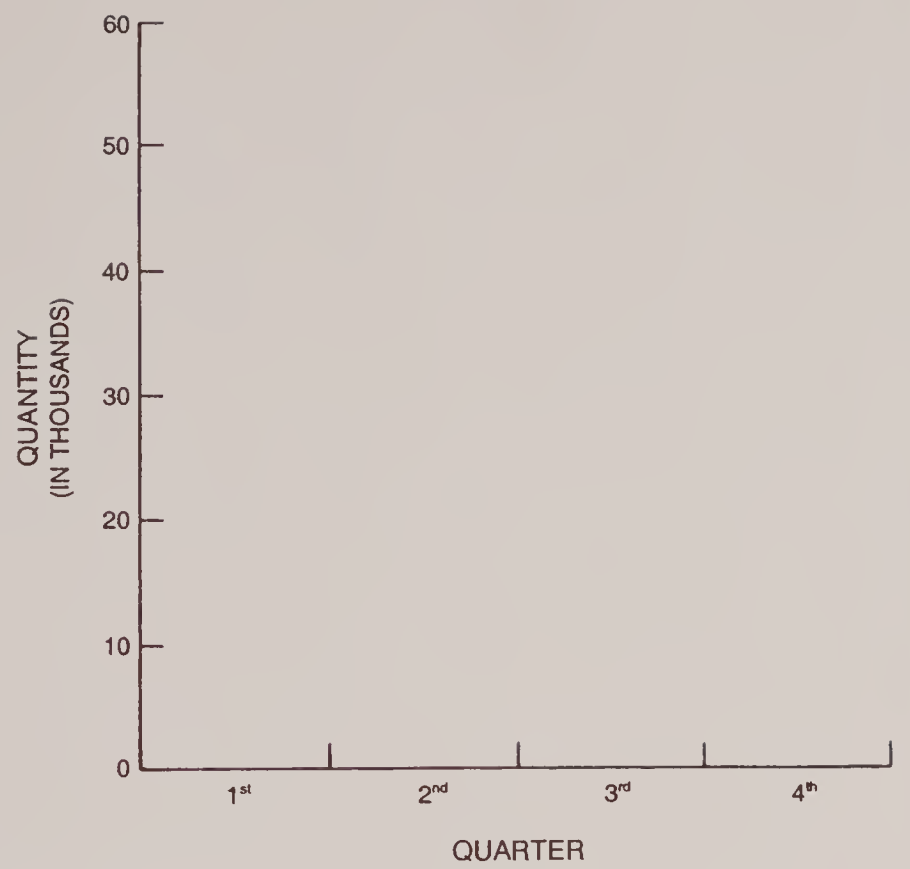
The editing of various types of graphics utilizes many of the same techniques described previously in this document. The key is in employing a *systematic approach* to the review of these visuals, and adjusting the approach to fit the unique character of each one. As an example, let's briefly evaluate the simple graph illustrated in Figure 8.

First take a general look at the graph to become familiar with it, as shown in Figure 8a. I find it useful to edit first the outside and then the inside of the figure. This helps to break it up into its component parts, for detailed analysis. So, Figure 8b displays just the outside of the graph. Observe the axis labels. Are they appropriate and spelled correctly? Examine the tick marks on both axes. Are they drafted adequately, with regard to length, boldness, and spacing? Now move on to the interior of the graph, in Figure 8c. Inspect the data line by itself. It should be quite prominent, since it is the whole reason for the graph. Is it drafted at an acceptable level of quality? Finally, view the graph in its entirety again – Figure 8d. Since you are now familiar with it, having examined its component parts, does it seem to make sense – that is, does the information the graph presents seem logical? (If there is any question, the originator of the illustration should be consulted.) Does the title adequately express the meaning of the figure? And, is all the text and linework of an appropriate size and boldness to succeed in the purpose of the illustration (whether it be for publication, presentation, or exhibit)?

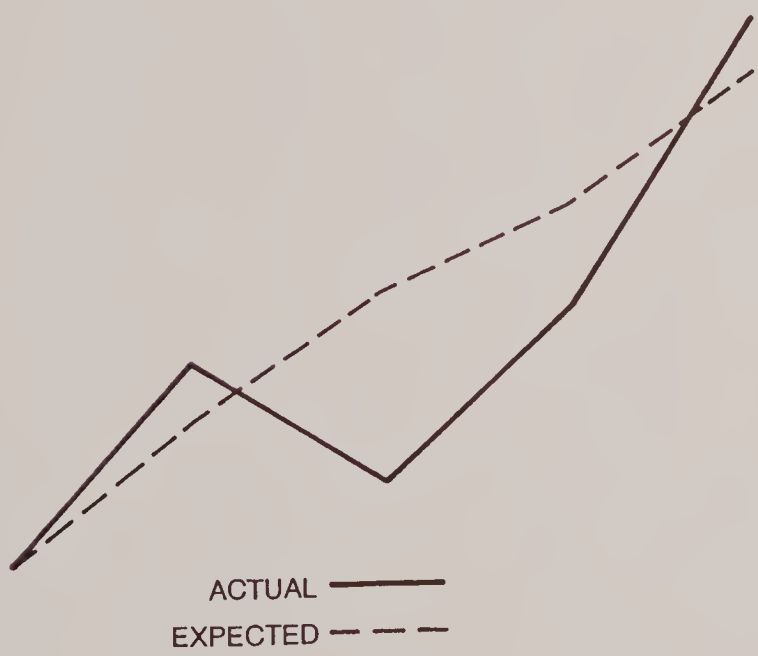
This was an example of a review of a very simple figure. Undoubtedly the graphics that you will be examining will be more complex. The important thing to remember is to use a *systematic approach* in your edit. Finally at the end, ask the question “Does this visual seem logical?” *Common sense* is the best editing tool of all!



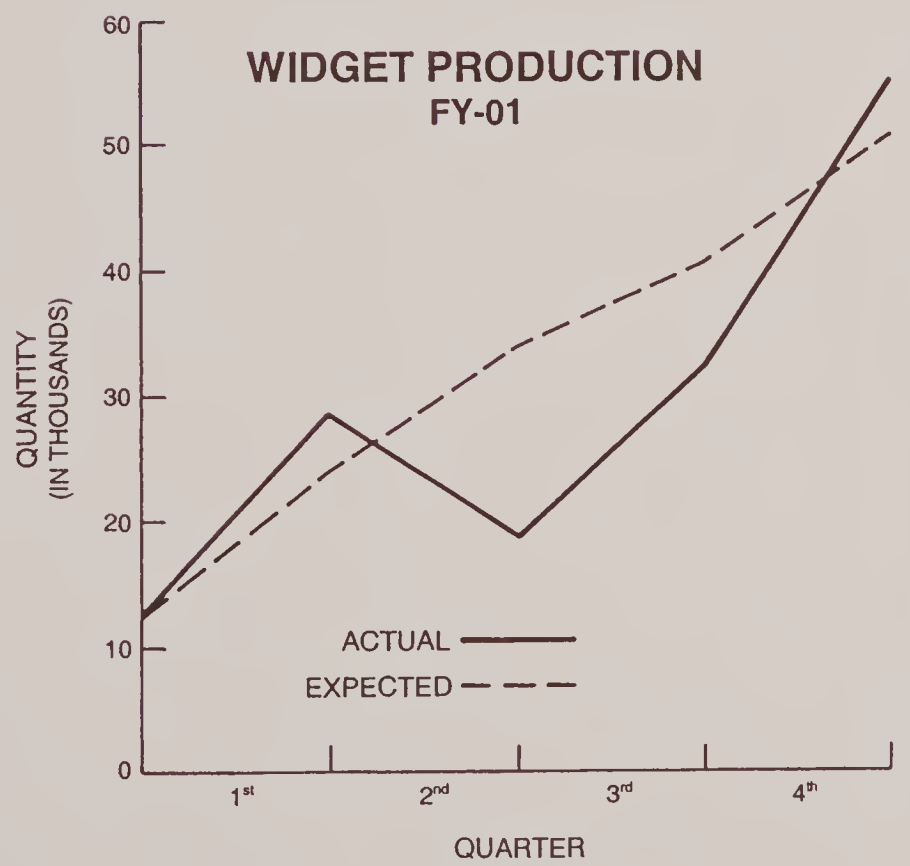
8a



8b



8c

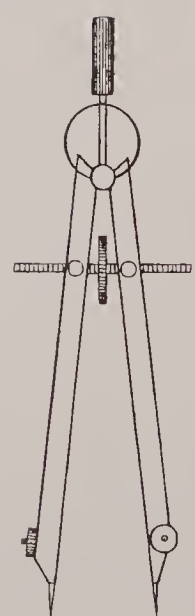


8d

Figure 8







APPENDIX



TYPE SIZES

4 POINT TYPE Point Type

5 POINT TYPE Point Type

6 POINT TYPE Point Type – *smallest acceptable mapping size type*

7 POINT TYPE Point Type

8 POINT TYPE Point Type – *ideal smallest mapping size type*

9 POINT TYPE Point Type

10 POINT TYPE Point Type

11 POINT TYPE Point Type

12 POINT TYPE Point Type

14 POINT TYPE Point Type – *smallest acceptable slide / vugraph size type*

16 POINT TYPE Point Type

18 POINT TYPE Point Type – *ideal smallest slide / vugraph size type*

20 POINT TYPE Point Type

24 POINT TYPE Point Type – *smallest acceptable display /
exhibit size type*

30 POINT TYPE Point Type

36 POINT TYPE Point Type

BIBLIOGRAPHY

There are a number of excellent books available on cartography. The list below mentions a few of them.

Elements of Cartography by Arthur H. Robinson, et al.

Cartography: Thematic Map Design by Borden D. Dent

Cartographic Design and Production by J. S. Keates

Introductory Cartography by John Campbell

Cartography: Visualization of Spatial Data by M. J. Kraak and F. J. Ormeling

Maps and Diagrams by F.J. Monkhouse and H.R. Wilkinson

Mapping by David Greenhood



ABOUT THE AUTHOR

Stephen Meszaros has been involved in the cartographic and graphic field for over 45 years. (He began actively drawing maps in grade school, on everything from note paper, to flattened paper bags, to old window shades!) Steve graduated from Delaware Literary Institute & Franklin Central School, in upstate New York, with School and Regents Diplomas in Science & Mathematics. He also received the school Geography Prize. At Syracuse University he took his Bachelor's Degree in Geography, specializing in cartography and physical geography. This was followed by 4 years in the U.S. Air Force as a Drafting and Cartographic Supervisor for the Aerospace Cartographic and Geodetic Service, based in Kansas. During this time he spent a year in Brazil and 6 months in Vietnam. Following military service Steve completed a Master's Degree in Geography at Arizona State University, concentrating on regional geography and historical & contemporary geographic thought.

Steve's civil service career began with the U.S. Geological Survey at the Center of Astrogeology in Arizona, the Water Resources Division in California, and the Special Mapping Center at USGS Headquarters in Virginia. In these positions he was a scientific illustrator, cartographer, and map editor. This was followed by 10 years with NASA as a visual information specialist for the Goddard Space Flight Center in Maryland and the Ames Research Center / Dryden Flight Research Facility in California. During this period of time Steve took a 6 month break in government service to become the Chief of the Public Affairs Office at Kitt Peak National Observatory in Arizona. For the past 14 years he has been a visual information specialist for the Arizona State Office of the Bureau of Land Management.

Steve's maps and visuals are used across the United States. His displays and exhibits have been shown in the U.S. and Europe, and his slide sets are featured world-wide. Most major astronomy textbooks contain his illustrations, as do many popular-level space science books and journals. His work has appeared on television and the World Wide Web (and one of his visuals has even been made into a jigsaw puzzle!)

Steve has been the recipient of many honors throughout his career, including the prestigious NASA Outstanding Service Award. He is the author of over 20 publications for NASA and the astronomical and educational community. Following retirement from the government with over 30 years of service, Steve plans to continue his work as a consultant to NASA and various universities.



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